

Chemical Composition (Nominal %)

Grade	Carbon Max	Oxygen Max	Nitrogen Max	Iron Max	Al	V	Pd	Mo	Ni	Hydrogen Max
Grade 1	0.08	0.18	0.03	0.2						0.015
Grade 2	0.08	0.25	0.03	0.3						0.015
Grade 3	0.08	0.35	0.05	0.3						0.015
Grade 4	0.08	0.40	0.05	0.5						0.015
Grade 5	0.08	0.20	0.05	0.4	6	4				0.015
Grade 7	0.08	0.25	0.03	0.3			0.20			0.015
Grade 9	0.05	0.12	0.02	0.25	3	2.5				0.015
Grade 11	0.08	0.18	0.03	0.2			0.20			0.015
Grade 12	0.08	0.25	0.03	0.3				0.3	0.8	0.015
Grade 16	0.08	0.25	0.03	0.3			0.05			0.015
Grade 17	0.08	0.18	0.03	0.2			0.05			0.015
Grade 18	0.05	0.15	0.03	0.25	3	2.5	0.05			0.015

Typical Mechanical Properties*

Grade	Tensile KSI Min	Yield KSI Min/Max	% Elongation/2" Min
Grade 1	35	25/45	24
Grade 2	50	40/65	20
Grade 3	64	55/75	18
Grade 4	80	70/95	15
Grade 5	130	120**	10
Grade 7	50	40/65	20
Grade 9	90	70**	15
Grade 11	35	25/45	24
Grade 12	70	50**	12
Grade 16	50	40/65	20
Grade 17	35	25/45	24
Grade 18	90	70**	15

*Mill Annealed Condition

**Minimum

Typical Physical Properties

	Grade 1, 2, 3, 4, 7, 11, 12, 16, 17, 18	Grade 5	Grade 9
Density	0.163 lb/in ³ <i>4.518/g/cm³</i>	0.160 lb/in ³ <i>4.423/g/cm³</i>	0.162 lb/in ³ <i>4.483/g/cm³</i>
Modulus	15 x 10 ⁶ psi	16 x 10 ⁶ psi	15 x 10 ⁶ psi
Beta Transus (± 25°F)	1635F - 1735°F	1800°F	1715°F
Thermal Conductivity	13-10 Btu/ft·h·°F	4 Btu/ft·h·°F	10 Btu/ft·h·°F
Thermal Expansion (32-600°F)	5.1 x 10 ⁻⁶ /°F	5.3 x 10 ⁻⁶ /°F	5.5 x 10 ⁻⁶ /°F
Melt Temperature	~3000°F	~3000°F	~3000°F